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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/678,758	10/02/2003	Haoren Zhuang	14580-037001	6618

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EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
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1765

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No. 10/678,758	Applicant(s) ZHUANG ET AL.	
	Examiner Lan Vinh	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 5 and 6 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 7, 13 and 16 is/are allowed.
- 6) ☒ Claim(s) 1, 3-4, 9-12, 14, 15, 17-19 is/are rejected.
- 7) ☐ Claim(s) 2 and 8 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/23/2007 has been entered.

Response to Arguments

2. The applicants argue that the ferroelectric material in the previously cited reference of Okita is not on an insulating layer as required in amended claim 1. This argument have been considered but are moot in view of the new ground(s) of rejection based on Ogawa et al (US 6,642,564) since Ogawa discloses forming a ferroelectric layer 34 on an insulating layer 18 (fig. 7B). The applicants also argue that layer 18 in Okita is not an electrode layer. This argument have been considered but are moot in view of the new ground(s) of rejection based on Ogawa et al (US 6,642,564) since Ogawa discloses depositing an electrode layer 37 into the openings formed in the ferroelectric layer 34

Claim Rejections - 35 USC § 102

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3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 3, 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Ogawa (US 6,642,564)

Ogawa discloses a method for forming a semiconductor memory having a ferroelectric capacitor. The method comprises the steps of:

depositing a ferroelectric material 34 (BST) on an insulating layer 18 (col 13, lines 14-35; fig. 7A)

a first etching step of etching of the ferroelectric material 34 to form openings in it (col 13, lines 30-35; fig. 7A)

depositing a conductive layer 37/electrode into the openings formed in the ferroelectric layer (col 13, lines 45-50; fig. 7A)

a second etching step, after depositing the layer 37/electrode, of etching to remove layer 37/electrode and an insulating layer 52 at the bottom of the openings to form opening /gaps in the layer 37 (col 13, lines 60-65; fig. 7B)

inserting conductive material 20 into the openings/gaps (col 14, lines 5-10; fig. 7C)

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Regarding claim 3, Ogawa discloses a step of planarizing to form a flat surface on the ferroelectric layer and depositing an insulating layer 41 over the layer 34 after inserting the layer 20 (fig. 6)

Regarding claim 4, Ogawa discloses that the conductive material fills the openings up to the planarization level (fig. 6)

5. Claims 14-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Ogawa (US 6,642,564)

Ogawa discloses a method for forming a semiconductor memory having a ferroelectric capacitor. The method comprises the steps of:

depositing a ferroelectric material 34 (BST) over an insulating layer 18 (col 13, lines 14-35; fig. 7A)

a first etching step of etching of the ferroelectric material 34 to form openings in it (col 13, lines 30-35; fig. 7A)

depositing a conductive layer 37/electrode into the openings formed in the ferroelectric layer (col 13, lines 45-50; fig. 7A)

a second etching step, after depositing the layer 37/electrode, of etching to remove layer 37/electrode and an insulating layer 52 at the bottom of the openings to form opening /gaps in the layer 37 (col 13, lines 60-65; fig. 7B)

inserting conductive material 20 into the openings/gaps (col 14, lines 5-10; fig. 7C)

planarizing to form a flat surface on the ferroelectric layer and depositing an insulating layer 41 over the layer 34 after inserting the layer 20 (fig. 6)

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Regarding claim 15, Ogawa discloses that the conductive material fills the openings up to the planarization level (fig. 6)

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa (US 6,642,564) in view of Higo et al (US 2003/0227799)

Ogawa method has been described above. Unlike the instant claimed inventions as per claims 9, 17, Ogawa fails to disclose that the insulating layer is Al₂O₃

Higo discloses a method for forming magnetic memory device comprises a step of forming an insulating layer of Al₂O₃ (page 2, paragraph 0010)

One skilled in the art at the time the invention was made would have found it obvious to modify Ogawa method by forming an insulating layer of Al₂O₃ as per Higo since Higo discloses that Al₂O₃ is generally used as insulating material sandwiched between ferroelectric material in order to obtain a large TMR ratio (page 2, paragraph 0010)

7. Claims 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa (US 6,642,564) in view of Okita et al (US 2003/0155595)

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Ogawa method has been described above. Unlike the instant claimed invention as per claim 10, Ogawa fails to disclose that the ferroelectric material is PZT

Okita discloses a method for forming a semiconductor device comprises a step of forming a ferroelectric material of PZT (page 4, paragraph 0061)

One skilled in the art at the time the invention was made would have found it obvious to modify Ogawa method by forming a ferroelectric material of PZT because PZT is a conventional reduction preventing material as taught in Okita (page 4, paragraph 0063)

8. Claims 11-12, 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa (US 6,642,564) in view of Sagae et al (US 6753,437)

Ogawa method has been described above. Unlike the instant claimed inventions as per claims 11-12, 18-19, Ogawa fails to disclose using iridium as the electrode/conductive material

Sagae discloses a method for forming thin film discloses using iridium as electrode/conductive material (col 1, lines 15-20)

One skilled in the art at the time the invention was made would have found it obvious to modify Ogawa method by using iridium as the electrode/conductive material as per Sagae because Sagae discloses that iridium has been used as a thin film electrode for semiconductor device such as FERAM and iridium has a low specific resistance and therefore it has excellent electric properties when they are used as electrode (col 1, lines 15-20)

Allowable Subject Matter

9. Claims 2, 8 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims

Claims 7, 13, 16 allowed.

The following is a statement of reasons for allowance. Regarding claims 7, 13, the cited prior art of record fails to disclose or suggest a method for forming a ferroelectric device comprises the step of depositing an electrode layer into the openings formed in the ferroelectric layer in which the first etching step leaves a film of ferroelectric material remaining at the bottom of the openings, in combination with the rest of the limitations of claims 7, 13

Regarding claims 8, 16, the cited prior art of record fails to disclose or suggest a method for forming a ferroelectric device comprises the step depositing an electrode layer into the openings formed in the ferroelectric material, the electrode layer has a thickness in the range of 15 nm to 20 nm, in combination with the rest of the steps of claim 8, 16, since the closet reference of Ogawa clearly discloses forming an electrode layer 37 having a thickness of 30 nm (col 13, lines 44-46)

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Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>.



LV

February 27, 2007